IDEM's Surface Water Quality Assessment Program

Fish Consumption Risk Assessment

Program Objective

The recreational sport of fishing as well as subsistence fishing are common and economically important activities in Indiana. Health studies have shown fish to be good for people to eat being high in protein and low in saturated fats. However, fish accumulate contaminants from the water they're in and from the foods they eat. Some of these contaminants can actually build-up in the edible portion of fish such as the muscle and fat tissue. Exposure to these contaminants through fish consumption can cause build-up of the contaminants in humans and fish eating wildlife.

Fish contaminant monitoring is a widely used method of assessing environmental contaminants and their bioavailability. Concentrations of some contaminants may be greater in tissues than in water or sediments because of bioaccumulation. Tissue contaminant monitoring provides a tool to measure contaminants in Indiana's environment that may not be easily measured in water or air. It also provides information on the availability of contaminants that are capable of bioaccumulating. The fish tissue contaminant monitoring program (see Fact Sheet: *Fish Contaminants Monitoring Program*) provides the vast majority of data used to support Indiana's Fish Consumption Advisories (FCA) for the protection of sport and subsistence anglers.

Health risks from eating contaminated fish cannot be predicted with certainty. However, the weight-of-evidence from epidemiological studies can be extrapolated to determine at what level of contaminant exposure a consumer may be increasing his or her risk for adverse health affects over a lifetime. The major contaminants of concern for which FCAs are being issued on Indiana rivers, streams and lakes at this time are polychlorinated biphenyls (PCBs) and mercury. In order for scientists to standardize assessing the risk level from exposure to contaminants such as PCBs and mercury certain assumptions are made in applying quantitative methods of risk assessment.

In the assessment of PCB contaminant levels a weight-of-evidence derived individual Health Protection Value (HPV) of 0.05 micrograms per kilogram of body weight per day (ug/kg-day) for total PCB residue ingested from fish tissue is used (Anderson *et al.* 1993). The HPV is intended to encompass acceptable cancer and reproductive/developmental risk. In the assessment of mercury contaminant levels a reference dose (RfD) of 0.3 ug/kg/day for mercury ingested from fish tissue for general populations (adult men, and women who don't plan on having children) is used (Shubat *et al*. 1995). Both of these exposure rates are not to be exceeded in the utilization of a standard meal size, consumption frequency, and reduction rate with cooking (PCBs only) over time. For example, in order to eat fish in an unlimited fashion the contaminant level in fish fillets would have to be less than a specified concentration in order for the consumer to not exceed that dose rate over the course of his or her lifetime. For the Indiana Fish Consumption Advisory the standards for calculating the potential exposure or exceedance of this dose rate is based on consuming an eight ounce serving (227 grams) per meal for a 154 pound (70 kilogram) adult with unlimited consumption being 225 meals per year (Anderson *et al*. 1993). In addition, the Advisory makes a recommendation of subtracting or adding one ounce of fish for every 20 pounds of body weight in order to follow the consumption rate advice.

Since PCBs concentrate in the fatty tissue proper cooking can reduce the amount of contaminant in the final product consumed after cooking. A fifty- percent reduction factor is included in the model for skin-on scaleless fillet preparation (such as largemouth bass or pan fish) and proper cooking. A thirty- percent reduction factor is included for skin-off fillets (such as catfish). In contrast to PCBs, cooking will not reduce the amount of mercury in a fish meal. Therefore, in calculating the consumption groupings for mercury, no reduction for preparation and cooking is factored. The only way to reduce mercury exposure when eating sport caught fish is to reduce one's overall consumption.

Grouping Categories of the Indiana Fish Consumption Advisory:

Total PCB

Group	*Skin-On Scaleless Fillets*	*Skin-Off Fillets*
1	*0 - 0.05 ppm*	*0 - 0.036 ppm*
2	*0.06 – 0.2 ppm*	*0.037 – 0.156 ppm*
3	*0.2 – 1.0 ppm*	*0.157 – 0.676 ppm*
4	*1.1 – 1.9 ppm*	*0.667 – 1.35 ppm*
5	*>1.9 ppm*	*>1.36 ppm*

Mercury

Group	
1	*<0.16 ppm*
2	*0.16 - 0.65 ppm*
3	*0.66 - 2.80 ppm*
4	*2.81 – 5.6 ppm*
5	*>5.6 ppm*

ppm=parts per million (mg/kg) wet weight

Advisory Groups of the Indiana Fish Consumption Advisory:

Group 1 Unrestricted consumption. **One meal per week for women who are pregnant or breast-feeding, women who plan to have children, and children under the age of 15.**

Group 2 Limit to one meal per week (52 meals per year) for adult males and females. **One meal per month for women who are pregnant or breast-feeding, women who plan to have children, and children under the age of 15.**

Group 3 Limit to one meal per month (12 meals per year) for adult males and females. **Women who are pregnant or breast-feeding, women who plan to have children, and children under the age of 15 do not eat.**

Group 4 Limit to one meal every two months (6 meals per year) for adult males and females. **Women who are pregnant or breast-feeding, women who plan to have children, and children under the age of 15 do not eat.**

Group 5 No consumption (DO NOT EAT)

Program Participants

Decisions on fish consumption advisories are made through the **Indiana Interagency Fish Consumption Advisory Workgroup** consisting of participants from IDEM, the Indiana State Department of Health (ISDH), and the Indiana Department of Natural Resources (IDNR). The Indiana Fish Consumption Advisory (FCA) booklet is issued annually through the ISDH.

The Indiana FCA may also be found on the Internet: ***http://www.in.gov/isdh/dataandstats/fish/fish_adv_index.htm***

Program Description

Media:	Contaminant monitoring results of fish tissue samples from surface waters including rivers, streams and lakes
Study Area:	Statewide
Site Selection:	see Fact Sheets: *Probabilistic Sampling Program,* and *Fish Contaminants Monitoring Program*.
Sampling Frequency:	see *Indiana Water Quality Monitoring Strategy: 2006-2010*
Data Collected:	Chemical contaminant levels in fish flesh

As a member State of the Ohio River Valley Water Sanitation Commission (ORSANCO), Indiana gives ORSANCO the responsibility of monitoring fish tissue contaminants in the Ohio River. As a Great Lakes State, Indiana participates in the annual Great Lakes Fish (tissue) Monitoring Survey sponsored and coordinated by the U.S. Environmental Protection Agency (U.S. EPA) Great Lakes National Program Office. In alternating years coho and chinook tissue samples are collected by IDNR for tissue contaminant analysis. A lab selected by GLNPO analyzes these samples. The results are reported by GLNPO to the participating states. The IDNR Division of Fish and Wildlife periodically collects fish tissue samples from Lake Michigan for IDEM to determine contaminant levels.

Program Products

- *Indiana's Fish Consumption Advisory* issued by the ISDH
- Use support designations of Indiana waters for Section 305(b) Report
- Assessments for Section 303(d) List of Impaired Waters in Indiana.
- Periodic technical reports on contaminant levels and trends.
- Support of the Environmental Performance Partnership Agreement (EnPPA) between Indiana and U.S. EPA.
- Support of Indiana's Remedial Action Plan for the Northwest Indiana Area of Concern.
- Support of the Lake Michigan Lakewide Area Management Plan.

References

Anderson, Henry A. MD, James R. Amrheim, Pam Shubat, John Hesse. 1993. Protocol For a Uniform Great Lakes Sport Fish Consumption Advisory. Great Lakes Fish Advisory Task Force Protocol Drafting Committee.

Shubat, Pamela, Mark Staba, and Hillary Carpenter. 1995. Criteria Used to Issue Fish Consumption Advice: 1995 Minnesota Fish Consumption Advisory. Section of Health Risk Assessment, Minnesota Department of Health. HRA Series FSH-95-001.

Contact Information

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IDEM Information: (317) 232-8603 or 800-451-6027 800-743-3333(TDD) toll-free for Indiana residents www.IN.gov/idem/water/ **Report Environmental Emergencies**: (888) 233-7745 **Confidential Technical Assistance:** (800) 988-7901 **Pollution Complaint:** www.IN.gov/idem/pollutioncomplaints/ **Questions and Comments:** www.IN.gov/idem/contact/questions.html	***For More Information on IDEM's Office of Water Quality…*** **Assessment Branch** (Surface water quality monitoring: rivers and streams, lakes, water quality standards) Shadeland Office, Indianapolis (317) 308-3173 **Compliance Branch** (Compliance and inspections, data and information services, wastewater certification and continuing education) Indiana Government Center North, Indianapolis (317) 233-2545 **Drinking Water Branch** (Public water supply supervision and ground water protection) Shadeland Office, Indianapolis (317) 308-3308 **Permitting Branch** (Facilities Construction & Engineering Support, Industrial & municipal permits, modeling, and wet weather) Indiana Government Center North, Indianapolis (317) 232-8760 **Watershed Planning Branch** (Rules development, wetlands, TMDL, watershed management) Indiana Government Center North, Indianapolis (317) 233-8488